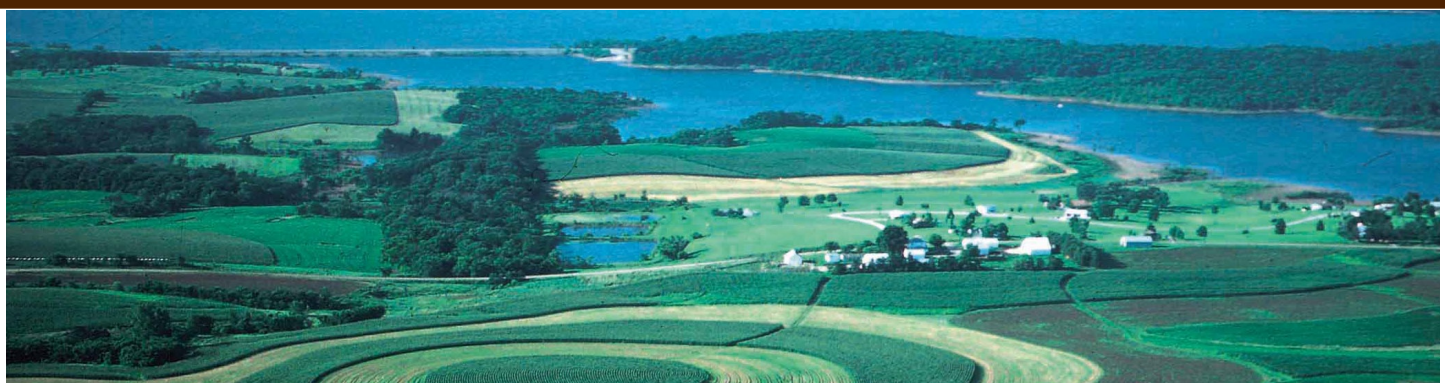


Natural Resource Issues in the Midwest Region

This chapter describes the resource issues facing the region and conservation efforts to address them.

Soil Erosion

This section discusses the conservation efforts to control soil erosion.

The Problem

Soil erosion caused by wind and water remains a significant agricultural and environmental concern in the Midwest Region. In 1997, approximately 25.5 million acres of cultivated cropland had erosion rates exceeding tolerable limits (T), thereby reducing soil productivity. In fact, about 39 percent of these acres are eroding at rates at least twice the tolerable limits. Excessive soil loss on agricultural land leads to depletion of the soil resource base, reducing the land's ability to produce food, feed, and fiber. Degraded soils require more input, such as fertilizer and energy, for tillage to produce crops equal to those grown on less eroded soils. This increases costs to producers and ultimately to consumers. On some eroded soils, it is impossible to replace the lost productivity with fertilizer and other amendments, so actual production potential is lost.

Soil erosion causes other problems also. Sediment and attached chemical particles are a serious threat to the quality of surface water within the region. Gully and streambank erosion frequently causes significant damages to roads, bridges, and other infrastructure. Wind blown soil can create significant air quality problems, reduce visibility, and damage crops.

In 1997, over 22 percent of the region's cultivated cropland was eroding at annual rates greater than the tolerable rate (T). T is the level of soil erosion that is tolerable, meaning that it does not harm soil productivity.

The Successes

Erosion rates in the region have been declining since the early 1980s. Much of this reduction is due to the conservation compliance provisions of the 1985 and 1990 Farm Bills, adoption of conservation tillage, and enrollment of highly sensitive lands in the Conservation Reserve Program (CRP). From 1992-1997, total erosion, due to water movement, was reduced 12.7 percent for the region. This compares to a 19.9 percent reduction from 1987-1992.

Significant reductions in soil erosion have occurred in the region, during the past 15 years. Due to water, annual rates of sheet and rill erosion on cultivated cropland have decreased from 5.7 tons/acre/year in 1982 to 3.7 tons/acre/year in 1997. This represents a reduction of over 35 percent, which compares to a national reduction of 29 percent for the same time period. (see figure 20)

Soil erosion occurring on cultivated cropland (compared to erosion on all other land) accounts for about 90 percent of all erosion in the Midwest Region. This percentage has remained fairly constant over the last 15 years. Cropland is eroding nationally at a rate of 1.3 billion tons per year. In the Midwest Region, water is the primary source for erosion. (see figure 21)

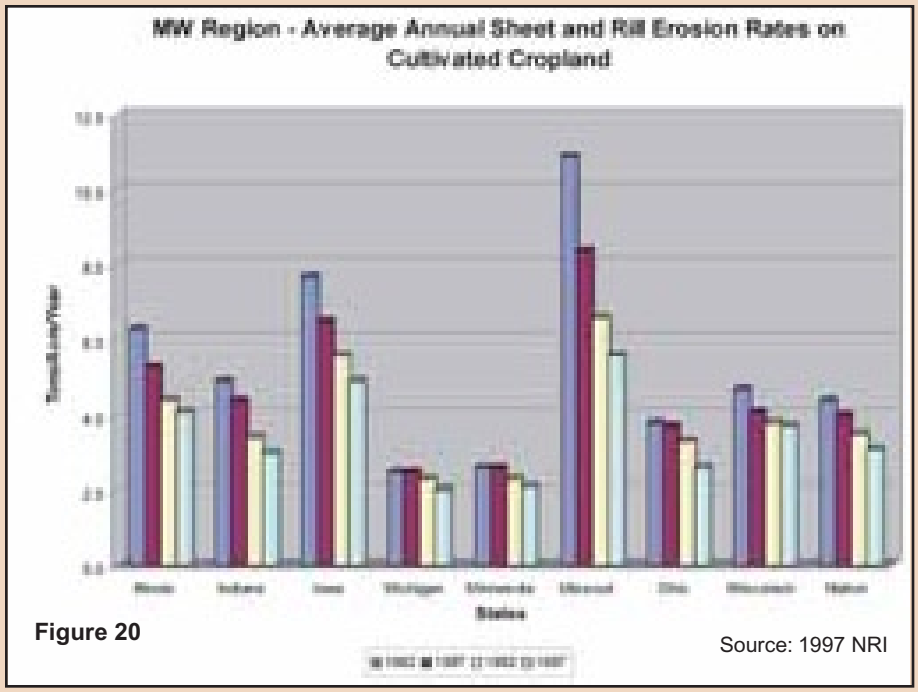


Figure 20

Source: 1997 NRI

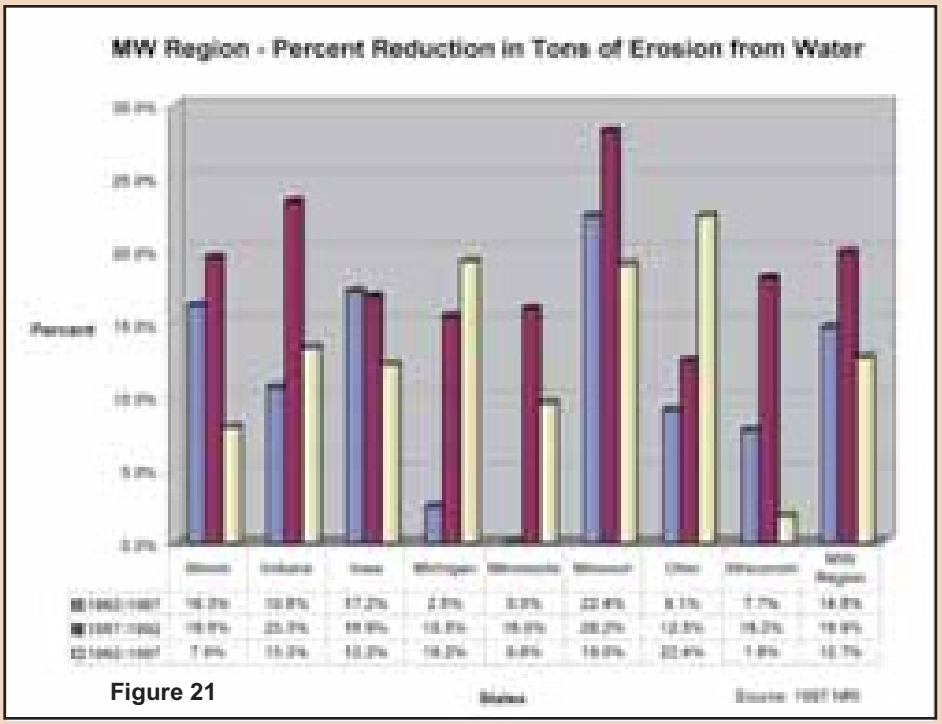


Figure 21

The Methods Used

Conservation tillage continues to have a great impact on the levels of erosion occurring on cropland in the region.

Conservation tillage includes any conservation system that covers at least a third of the soil with crop residue after planting.

In 1998, there was approximately 50 million acres of cropland with conservation tillage systems or about 46 percent of the nation's acreage of conservation tillage. Iowa and Illinois were the top two states in the country with over 21 million acres of conservation tillage. However, from 1997 to 1998, the region experienced a decline of over 2.2 million acres of conservation tillage. This decrease represents a 10 percent decline of conservation tillage within the region. (see figure 22)

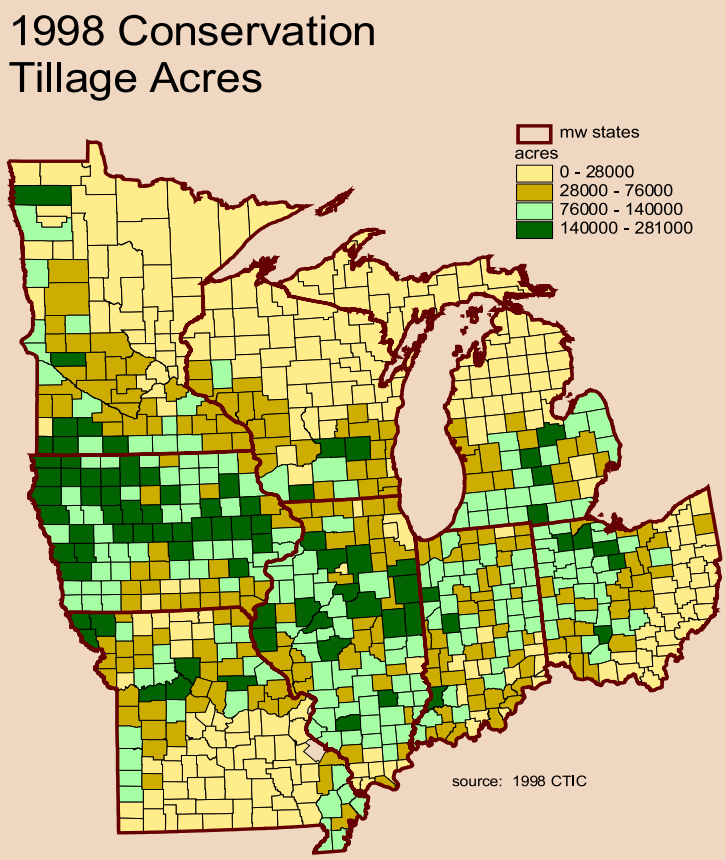


Figure 22

CRP has also had a significant impact on the reduction of soil erosion in the region. In 2000, approximately 7.3 million acres were enrolled in CRP. (see figure 23)

Through this program, landowners are encouraged to protect fragile land by planting resource-conserving cover to improve soil, water, and wildlife resources. Currently, over 22 percent of the land enrolled in CRP nationally is within the region.

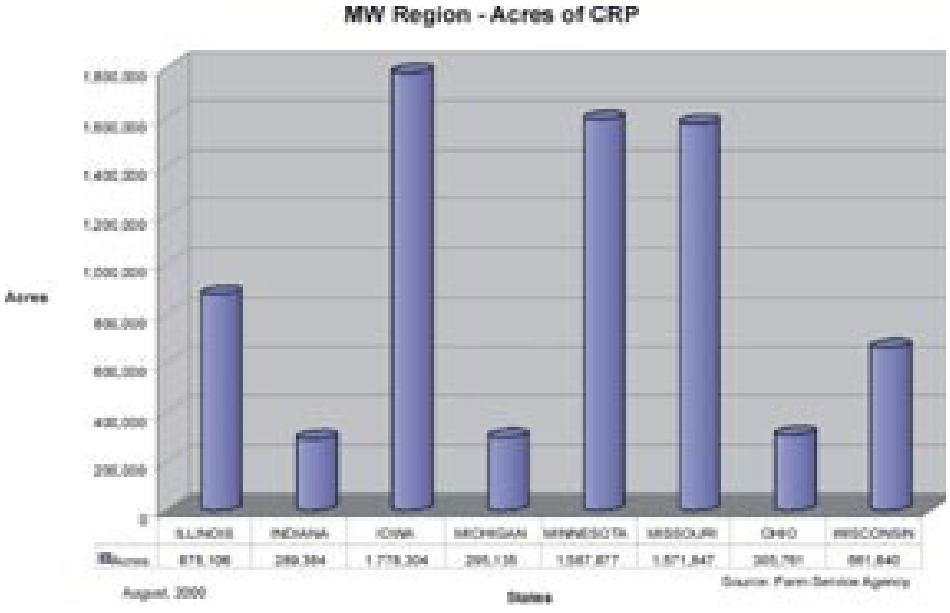


Figure 23

Another initiative impacting the reduction of erosion in the region is the National Conservation Buffer Initiative. In 1997, USDA officially launched this initiative, which pledged to help landowners install conservation buffer practices. Conservation buffers, when coupled with other appropriate conservation practices, can play an important role in reducing erosion and sedimentation. The Continuous CRP and the Conservation Reserve Enhancement Program (CREP) have been developed to help landowners establish conservation buffer practices.

Since 1997, more than 50 percent of the buffer acres established nationally have been in the region. As of October 1, 2000, approximately 665,000 acres of buffers have been established in the region through the Continuous CRP and CREP. (see figure 24)

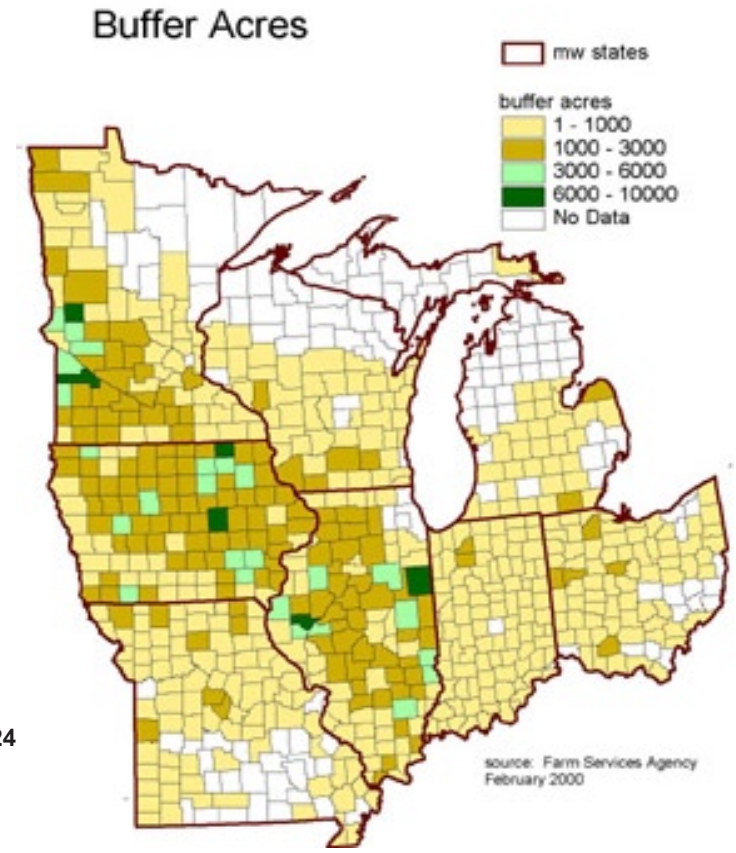


Figure 24

The Soil Erosion Concern Remains

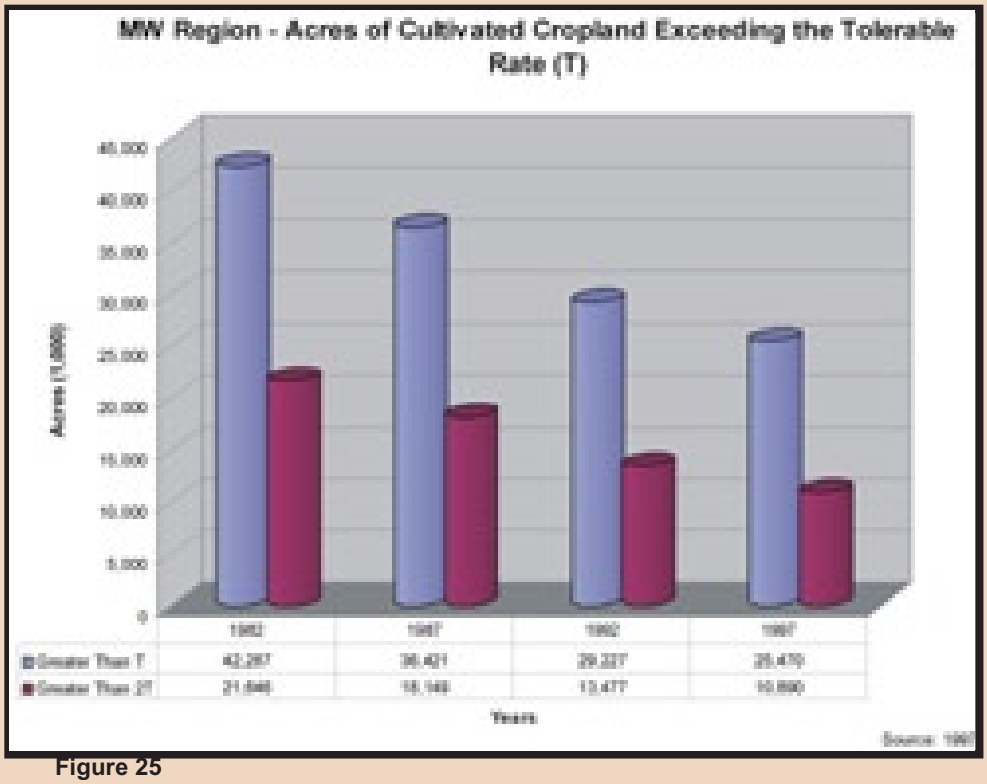


Figure 25

Even with the significant accomplishments during the last 15 years, excessive erosion continues to be a serious problem in the region. In 1997, nearly 26 million acres of cultivated cropland exceeded the tolerable annual erosion rate (T), and over 10 million acres were eroding at a rate of twice the tolerable rate. (see figure 25) Based on this data, more than 22 percent of the cultivated cropland in the region are eroding at annual rates greater than the tolerable rate (T). Even though this percent has decreased from 34 percent in 1982, there is considerable conservation needed in the region to address soil erosion.

Summary of Soil Erosion

Significant reductions in soil erosion have occurred in the region, during the past 15 years. These reductions have been a result of the conservation compliance provisions of the 1985 and 1990 Farm Bills, adoption of conservation tillage, and enrollment of highly sensitive lands in the CRP. However, even with the significant accomplishments during the last 15 years, excessive erosion continues to be a serious problem in the region. While erosion can reduce soil productivity, it also has a substantial effect on the quality of our air and water resources. NRCS will continue to work with producers on addressing excessive erosion on the 26 million acres of cultivated cropland that are eroding at rates that are harmful to the soil productivity and the environment.

Midwest Region Soil Erosion Facts

- From 1992-1997, total erosion, due to water movement, was reduced 12.7 percent for the region.
- The annual rates of sheet and rill erosion on cultivated cropland, due to water, have decreased 35 percent from 1982-1997.
- In 1998, 46 percent of the nation's acreage of conservation tillage was in the region; however, the acres of conservation tillage did decline 10 percent in the region from 1997-1998.
- Currently, within the region, there is approximately 7.3 million acres enrolled in CRP or 22 percent of the national total.
- As of October 1, 2000, approximately 665,000 acres of buffer conservation has been established in the region through the Continuous CRP and CREP
- In 1997, nearly 26 million acres of cultivated cropland (or 22 percent) exceeded the tolerable annual erosion rate (T).

Wetlands

This section discusses wetland resources in the region.

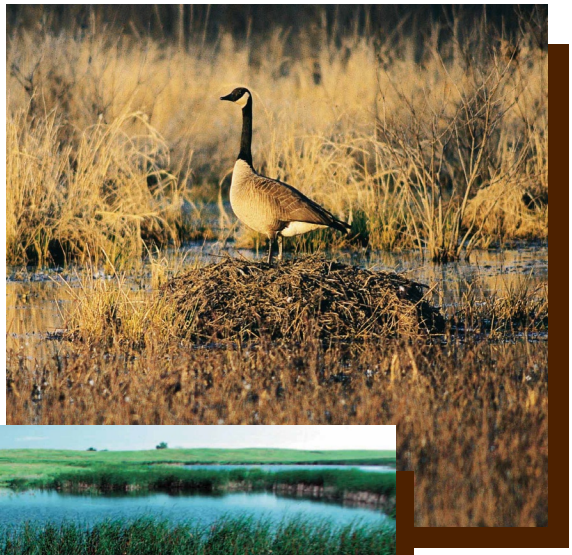
Wetland conservation is one of the most important and sensitive natural resource issues in the Midwest Region, in both agricultural and non-agricultural areas. "Wetlands" describes a variety of areas where plants and animals, especially suited to wet environments, can be found.

Wetlands are important because they have unique functions and values. They provide floodwater retention, groundwater recharge and discharge, streambank and shoreline stabilization, and sediment trapping. In addition to the traditional role of providing essential habitat for waterfowl, other migratory birds, and resident wildlife; wetlands also aid in the removal of nutrients and chemicals, providing forage, and livestock water.

Conversion of wetlands to agricultural land has declined steadily since the 1950s. In the mid-1950s, agriculture, with government encouragement, was responsible for an estimated 87 percent of wetland conversion. In contrast, between 1982 and 1992, 56.7 percent of the total wetland losses were attributed to urban development and only 19.8 percent to agriculture. (see figure 26)

The requirements of the Clean Water Act; the 1985 Food Security Act; as amended by the 1990 and 1996 Farm Bills; and the 1993 Federal Wetlands Policy have heightened the awareness and controversy of wetlands across the nation.

In 1997, the region had approximately 27,032,100 acres of palustrine wetlands, which represented about 25 percent of the nation's wetlands. This figure represented a loss of 74,200 acres of wetlands for the period of 1992-97. Over half of the losses can be attributed to agricultural activity and one-third to urban development.



Wetlands are often called the "kidneys of the landscape," mother nature's way of filtering out harmful materials.

Annual Wetland Losses for Agriculture Uses such as Cropland and Pastureland

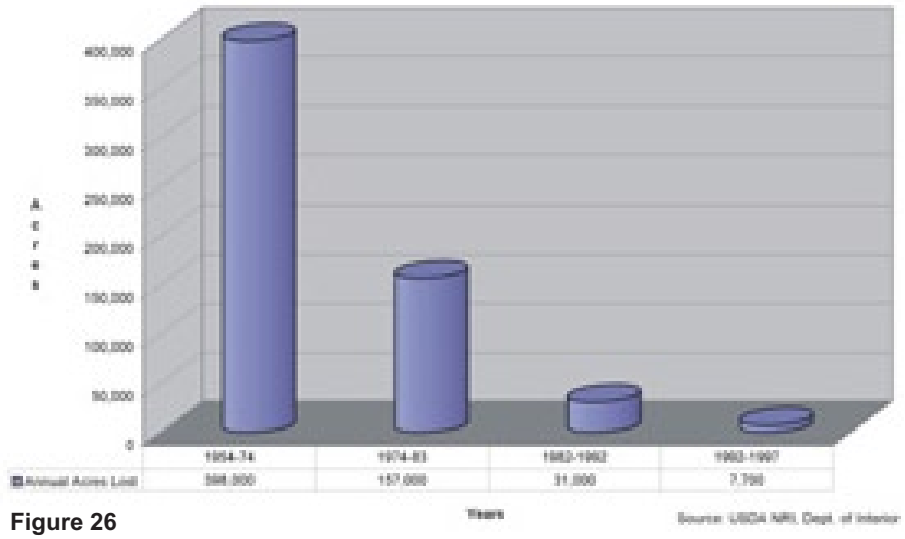


Figure 26

"No net loss" and a call for a long-term gain sets the stage for the treatment of wetlands. The goal of "no net loss" refers to the Nation's overall wetland base. There must be a balance between wetland losses and gains in the short run and an increase in wetland acreage in the long run.

Achieving "no net loss" and moving into a net gain in wetlands may be possible, if restoration programs like the USDA's Wetlands Reserve Program (WRP) continue to be sufficiently funded. (see figure 27)

The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. NRCS provides technical and financial support to help landowners. Since 1992, there have been more than 311,000 acres of wetlands restored or in the process of being restored in the region through the WRP and Emergency Wetlands Reserve Programs (EWRP). (see figure 28)

The acres have been enrolled through the acquisition of over 2,600 easements. The wetland conservation programs have been very successful and popular in all eight states within the region.

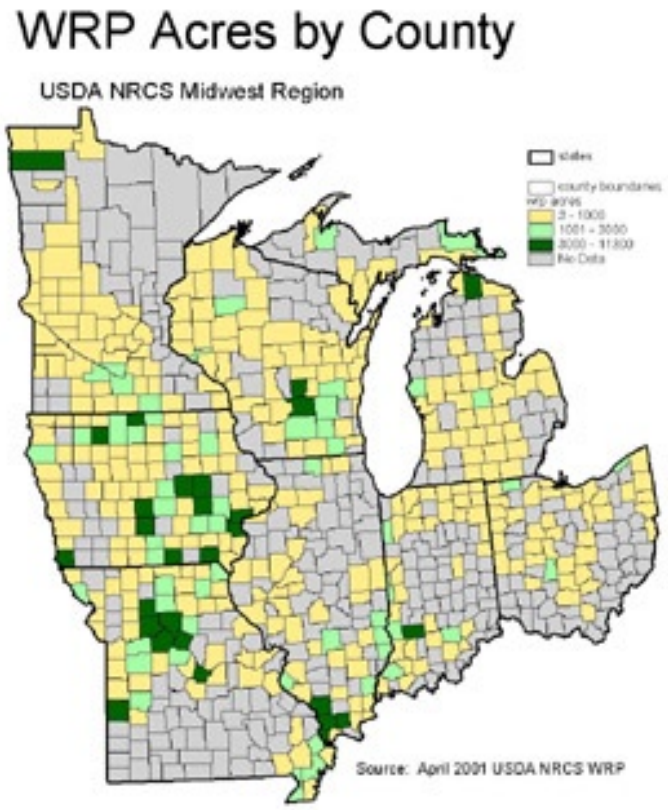


Figure 27

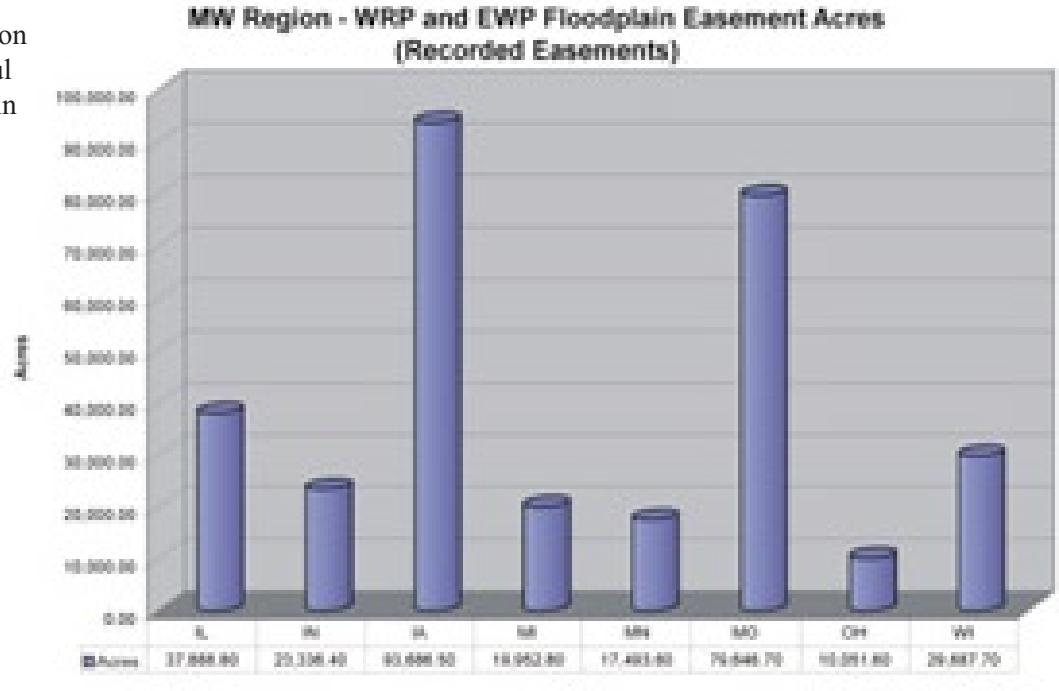


Figure 28

Source: NRCS

Animal Waste/ Nutrient Management

This section discusses the magnitude of the animal waste and nutrient management issues in the region.

Animal waste and nutrient management are critical issues in the Midwest Region. The high levels of livestock production ensures this issue continues to be a high priority for producers, NRCS, and partners. Nonpoint source contamination of water remains one of the most significant challenges facing agriculture today. Water quality data continues to identify agriculture as one of the major contributors to impairment of water resources.

As part of the 1998 Clean Water Action Plan, the "Unified National Strategy for Animal Feeding Operations" directed USDA and EPA to jointly implement a strategy to minimize environmental and public health impacts from Animal Feeding Operations (AFOs). An AFO is an agricultural enterprise where livestock are kept and raised in confined situations for 45 days in a 12-month period, e.g. feedlots. This joint strategy calls for the development of Comprehensive Nutrient Management Plans (CNMP) to address the AFOs resource concerns.

It is estimated that there are approximately 108,500 AFOs in the region that need CNMPs. This figure represents 39 percent of the AFOs nationally needing CNMPs.

Over 39 percent of the nation's Animal Feeding Operations (AFOs) needing Comprehensive Nutrient Management Plans are in the Midwest Region.

The trend of concentrating livestock into larger units has produced large volumes of manure. In today's agriculture, thousands of cattle and hog operations require large amounts of imported feed. Therefore, large amounts of manure need to be exported or utilized properly. Concentrated animal production sites are of particular environmental concern because of the potential for nutrient and bacterial contamination of water resources. Odor problems affect air quality as well. Industrialization of the livestock production sector, spurred by economies of size, and new production and processing technologies has produced livestock concentrations and geographic shifts within the region.

The link between feed production and livestock concentration in the region allows for land application of animal manure and recycling of the nutrients in the crop production system. However, this application does not mean that all manure is now being handled adequately. Proper storage and application of manure will help ensure that the available nutrients do not threaten or pollute water resources.

Within the region, there has been a slight decline in the number of animal unit* equivalents on livestock farms from 1982 to 1997. In 1997, there were just over 21.3 million animal units in the region, which compares to 27.8 million in 1982 (23 percent decline). In 1997, Iowa and Missouri accounted for 42 percent of the total animal units within the region. In 1997, the region accounted for 23 percent of the national total of animal units. (see figure 29)

(* An animal unit (AU) is equal to 1000 pounds of live animal weight.)

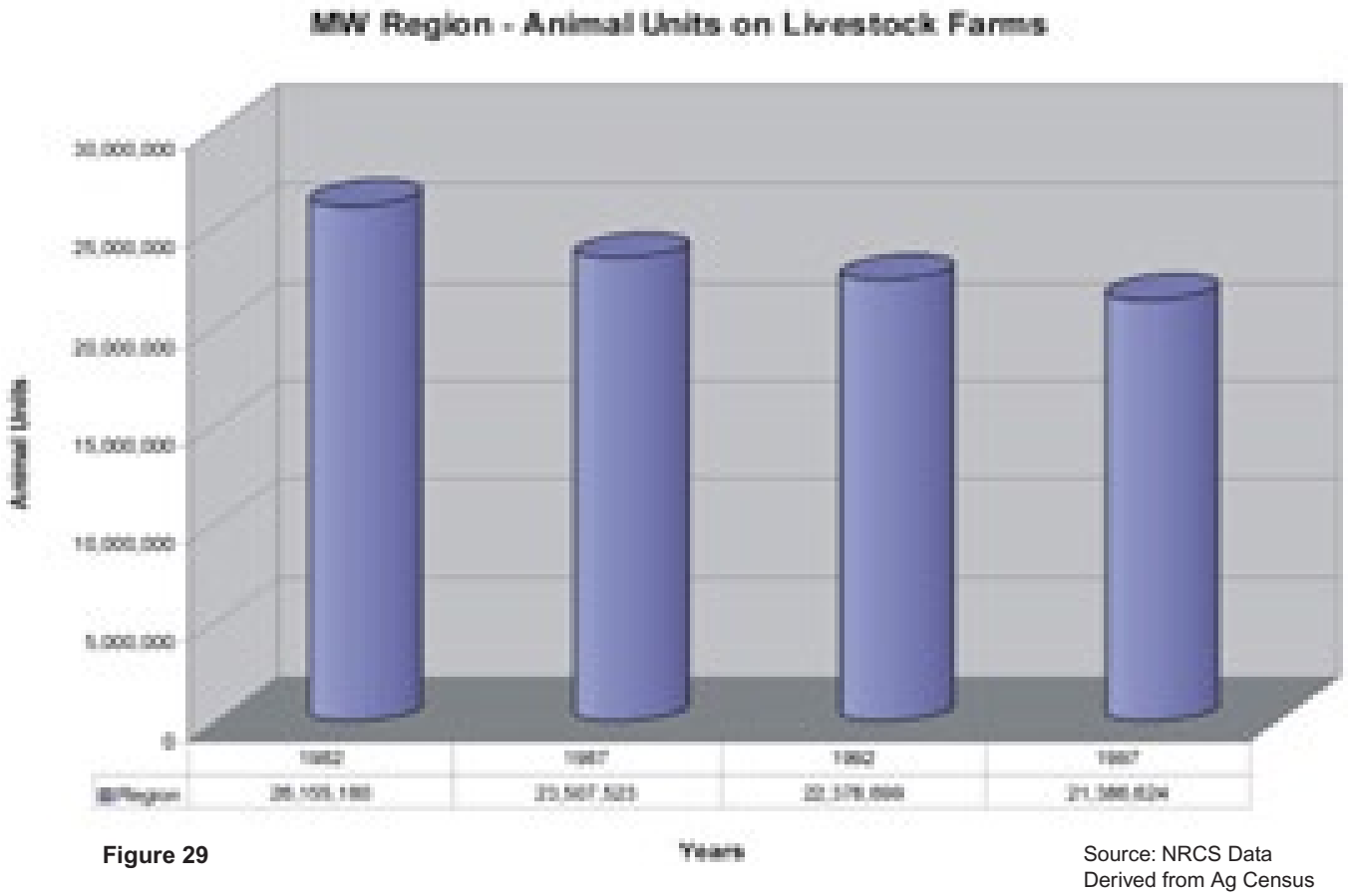


Figure 29

Source: NRCS Data
Derived from Ag Census

Livestock facilities have grown in size and concentration. This has caused legitimate concerns and has increased the perception of fears about these facilities. Environmental concerns revolve around nutrients, pathogens, and odors. Manure management should not, however, be limited to storage and proper handling. The concentration of livestock production on a decreasing number of farms and into facilities of ever-increasing size creates real challenges for proper manure management.

Large livestock facilities may not have access to enough cropland to distribute their manure at agronomic rates. The concentration of confined livestock facilities is an issue when discussing proper manure management. In 1997, there were 12.1 million confined animal units within the region. These confined livestock were associated with 183,000 livestock operations. The number of livestock operations with confined livestock declined 39 percent from 1982 to 1997; whereas, the number of confined livestock only declined 12 percent for the same time period. (see figure 30)

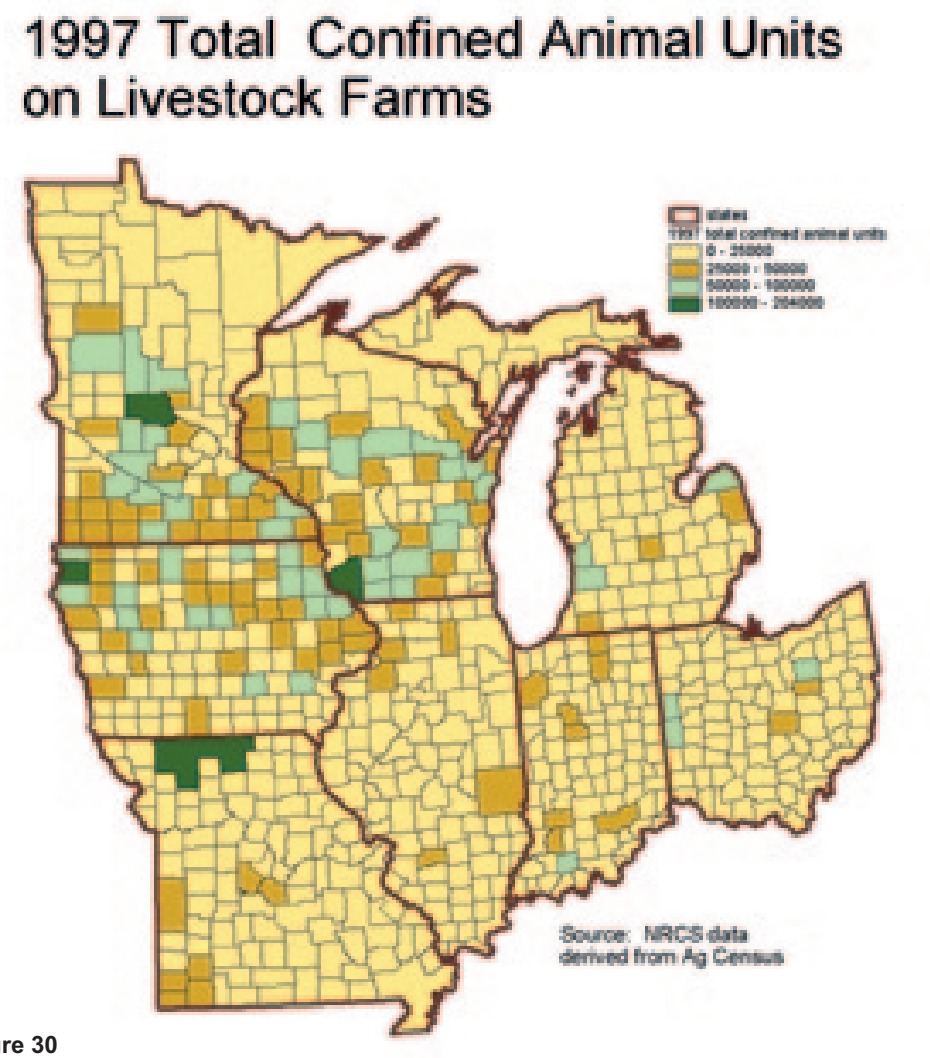


Figure 30

NRCS and their core conservation partners (State agencies, Conservation Districts, and RC&D) completed a detailed workload analysis (WLA 2001). Within this analysis, core conservation partners identified total conservation needs for county resource related work products. County conservation needs were developed from a variety of data sources including: ag census, NRI, state assessments, and county data. Conservation needs included estimates of numbers of animal waste management systems needed, planned, and applied in each county. These estimates are based on scientific data and knowledge at the local level. The data is being used by NRCS and partners to assess the magnitude of animal waste issues.

The Clean Water Action Plan of 1998 directed USDA and EPA to jointly implement an AFO strategy to address nutrient management issues from livestock manure. This strategy has been developed and for the vast majority of AFOs, voluntary efforts will be the principal approach in assisting livestock owners and operators in developing and implementing CNMPs. The goal of USDA/EPA is to help owners and operators take action to reduce and eliminate water pollution originating from AFOs. It is estimated that each CNMP requires approximately 160 hours of technical assistance to prepare and implement a typical plan with each livestock producer. It is estimated that planning and implementation of these plans within the region will require $117 million annually for the next 9 years. (see figure 31)

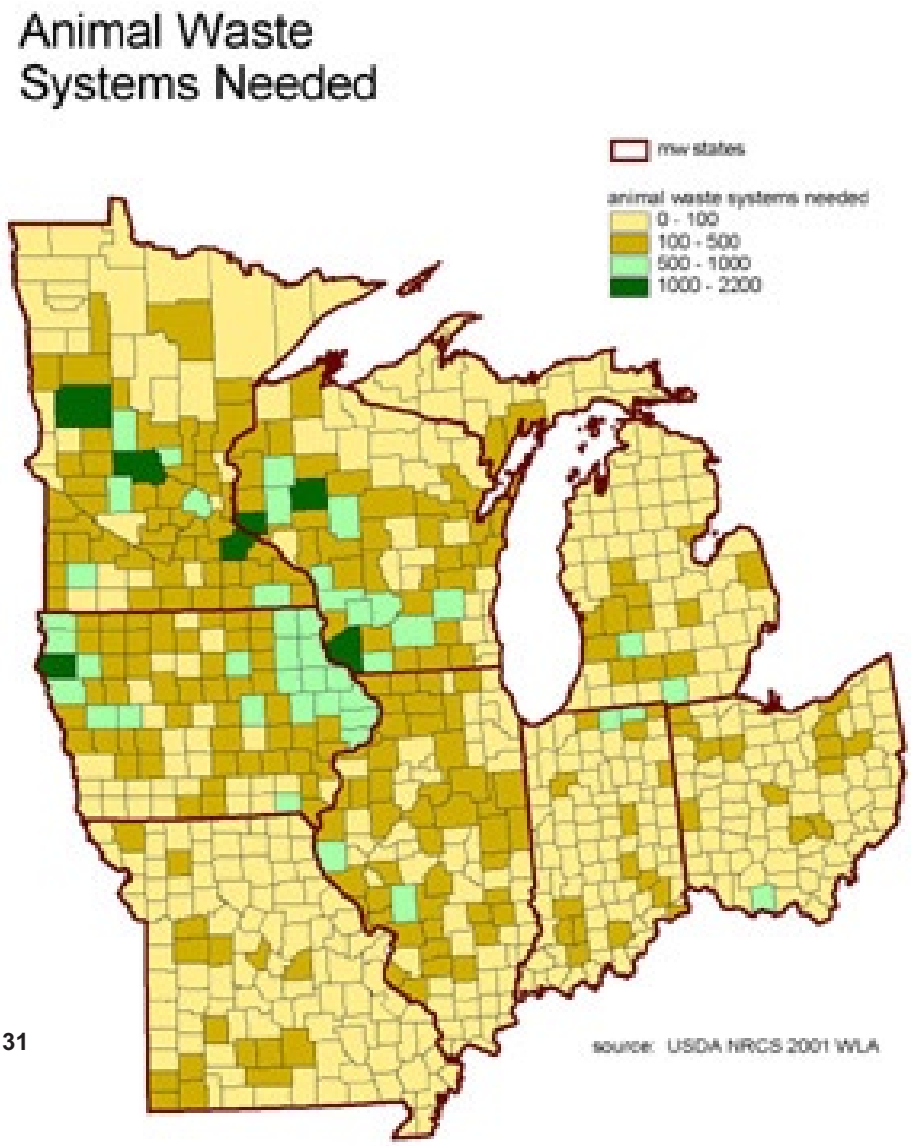


Figure 31

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) provides technical and financial assistance to landowners for the purpose of installing conservation practices to protect soil and water quality. At least 50 percent of financial assistance is targeted to livestock related natural resource problems and other locally identified conservation priorities. (see figure 32)

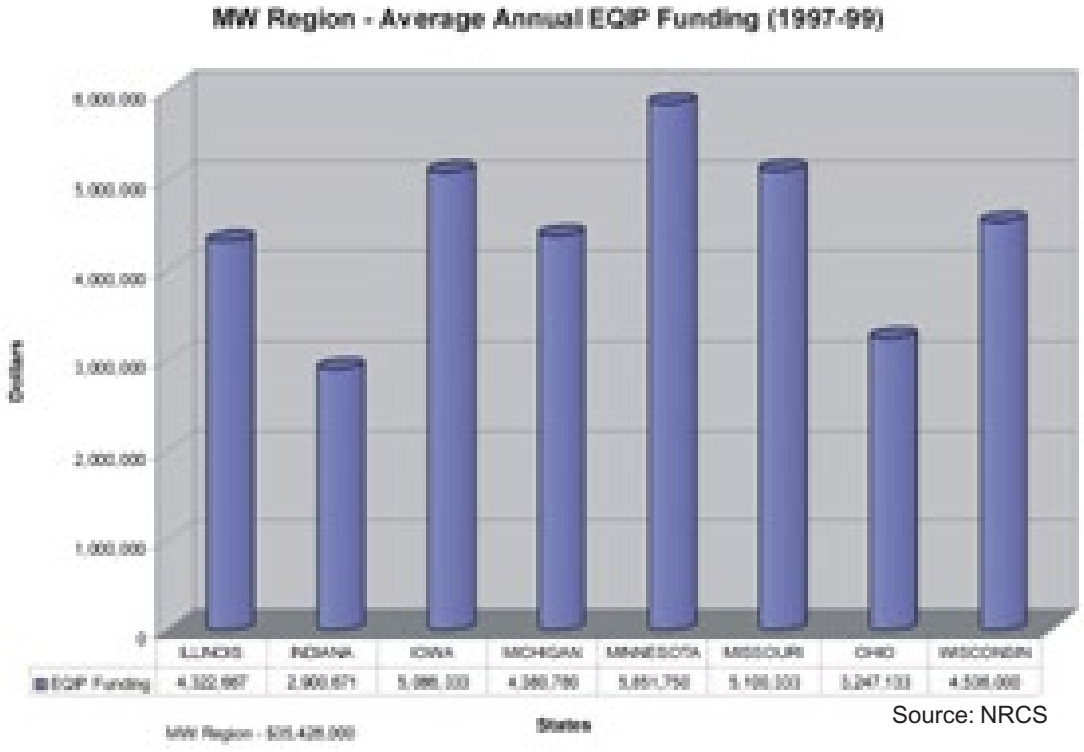


Figure 32

Source: NRCS

Summary of Animal Waste and Nutrient Management

Animal waste and nutrient management are critical issues in the Midwest Region. The concentration of livestock production, on a decreasing number of farms and into facilities of ever-increasing size, creates real challenges for proper manure management.

Animal Waste and Nutrient Management Facts

- The Clean Water Action Plan of 1998, directed USDA and EPA to jointly implement a strategy to minimize environmental and public health impacts from Animal Feeding Operations (AFOs).
- The Midwest Region has more than 108,500 AFOs needing Comprehensive Nutrient Management Plans (CNMPs), which represents 39 percent of the nation's needs.
- In 1997, the region had more than 12 million confined animal units associated with more than 183,000 livestock operations.
- Within the region, the number of confined livestock operations has declined 39 percent from 1982 to 1997; whereas, the number of confined livestock only declined 12 percent for the same period.
- The region will require more than $117 million annually for the next 9 years to complete all of the planning and implementation of the Comprehensive Nutrient Management Plans for the region's AFOs.

Loss of Farmland to Development

This section describes the conversion of farmland and other open space to development.

The USDA 1997 National Resources Inventory (NRI) shows an accelerated loss of farmland to development or non-agricultural uses in the Midwest Region. More than 1.9 million acres of the region's cropland, forestland, and other open space were converted to urban and other uses from 1992 to 1997. The average rate for conversion in 5 years (376,800 acres) is almost 1.5 times the rate of conversion during 1982 to 1992 (213,100 acres). More than 1.9 million of the acres converted to urban and built-up land between 1992 to 1997 were some of the region's best prime and unique farmlands. (see figure 33)

Urban sprawl and the loss of farmland are evident to anyone familiar with suburban America. Urban growth continues to impact the availability of land for agriculture. Demographers now predict a long-term and gradual dispersal of the United States population into smaller, less densely settled cities and towns. The 1997 NRI data shows that this trend has already started in the region. The loss of farmland is no longer centered predominately around major metropolitan areas, but is affecting growing numbers of small and mid-sized cities as well.

States with the highest acreage conversion rates in the region are Michigan and Ohio. Five states – Michigan, Ohio, Minnesota, Missouri, and Illinois – rank in the top-twenty list of states nationally. Figure 34 on the following page, provides data and comparisons for the loss of farmland to development for the 15-year period from 1982 to 1997.

The acreage converted to urban and built-up land during the 5-year period (1992-1997) translates into the region losing farmland at a rate of approximately 1,040 acres per day or 43 acres every hour.

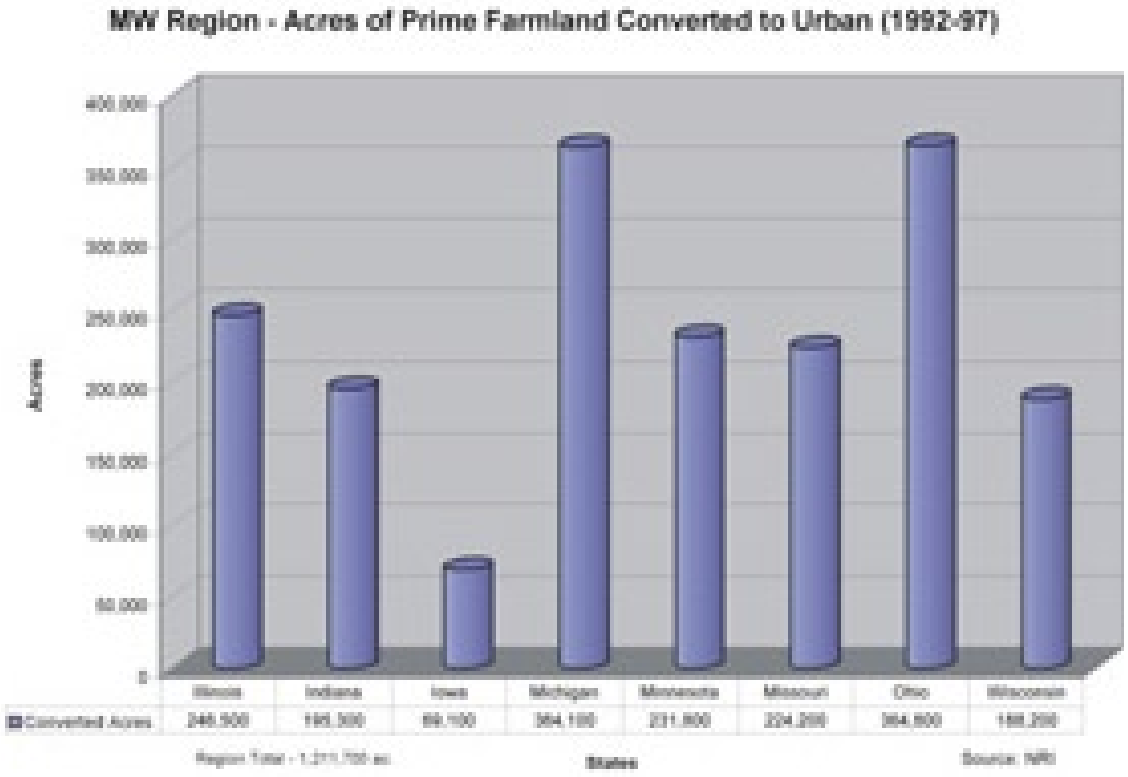


Figure 33

Loss of Farmland to Conversion

1992-1997 Rank	State	1992-1997 Change in Total land Developed (Acres)	1992-1997 Average Annual Conversion Rate (Acres)	1982-1992 Rank	1982-1992 Change in Total land Developed (Acres)	1982-1992 Average Annual Conversion Rate (Acres)
8	Ohio	364,800	73,000	8	463,700	46,400
9	Michigan	364,100	72,800	9	456,100	45,600
14	Illinois	246,500	49,300	19	246,800	24,600
17	Minnesota	231,800	46,400	21	233,800	23,400
18	Missouri	224,200	44,800	25	209,300	20,900
23	Indiana	195,300	39,100	23	230,300	23,000
24	Wisconsin	188,200	37,600	20	240,500	24,100
39	Iowa	69,100	13,800	45	50,800	5,100
Total	Regional	1,884,000	376,800		2,130,300	213,105
Total	National	11,217,000	2,243,400		13,788,900	1,378,900
Percent		16.80%	16.80%		15.50%	15.50%

Figure 34

Summary of Loss of Farmland to Development

The conversion of agricultural land to other uses results in the fragmentation of agricultural land, the loss of family farms, the disappearance of historic landscapes, and the loss of open spaces and places of scenic beauty. Once productive farmland is developed, it may be lost forever. In addition, the acreage that remains in agriculture is placed under greater environmental, economic, and social stresses.

Carbon Sequestration

This section introduces some causes of climate changes and solutions.

Changes in the Earth's climate and biosphere might be induced by the increasing concentrations of certain gases that have the potential to store heat. They are also referred to as greenhouse gases. Included in those greenhouse gases are carbon dioxide, methane, and nitrous oxide, which lend themselves to causing a warmer climate.

Photo:NOAA

Using carbon dioxide as an example, on a global scale, there is a net increase of 3.5 gigatons of carbon per year in the atmosphere as carbon cycles through the environment. (see figure 35)

In order to reduce the net increase, carbon must either be accumulated or reduce the emissions into the atmosphere.

Globally, agriculture contributes 20 percent of the greenhouse gases according to the Department of Energy. U.S. agricultural emissions represent 2 percent of the carbon equivalent emissions produced by the three greenhouse gases. Carbon dioxide released through plant and soil respiration, methane from decomposing animal waste, and nitrous dioxide from decomposing organic matter in soil are the three primary greenhouse gases produced by agriculture.

Planting trees, biofuels, and conservation tillage, in this order, have the potential of reducing emissions by over 15 percent in the U.S. (see figure 36 on the following page.)

Potential for Reduction

Carbon Dioxide

Carbon dioxide mitigation in agriculture includes reducing agricultural emissions, sequestering carbon in soils and trees, and utilizing bio-mass for the production of fuels.

Forestation

In the United States, the amount of forestland (737 million acres) has remained fairly constant over the past several decades, with an annual average fluctuation of about 0.1 percent per year. Improved forest management practices, planting trees, timber harvesting, and landuse have resulted in a net annual uptake of carbon.

Most of the timber that is harvested from U.S. forests is used in wood products that are eventually disposed of by landfills, rather than by incineration. Thus, significant quantities of harvested carbon are transferred to long-term storage pools (e.g., the timber used to construct a house) rather than immediately being released to the atmosphere (e.g., combustion as a fuel).

Idle cropland in the United States totaled about 56 million acres in 1995.

In the Midwest Region, NRCS has already assisted private landowners with planting over 260,000 acres of trees on idle CRP land.

If an area this size were planted in trees, and if an average weight of about 2.0 tons of carbon/acre, including increases in soil and litter carbon were stored each year, the total carbon uptake would be about 112 million metric tons of carbon per year (MMTC/yr), or about 8 percent of total U.S. carbon dioxide emissions in 1992.

Global Carbon Cycle

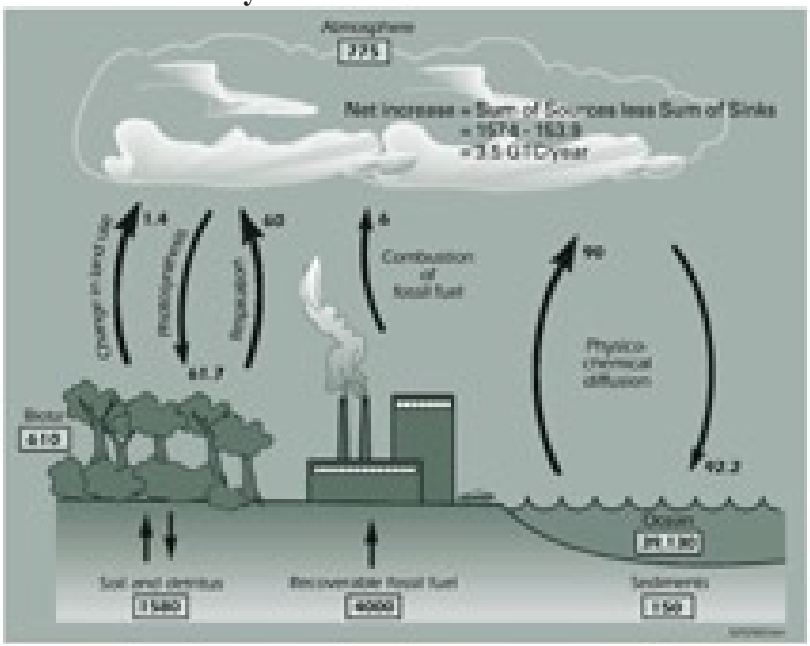


Figure 35. 1 Gigaton of Carbon (GTC) = 1000 Million Metric Tons of Carbon (MMTC) = 10 million of 100 metric tons railroad coal cars.

Biomass-Derived Fuels, Power, and Products

Another way to reduce carbon dioxide emissions from fossil fuels is to displace some of the carbon with carbon derived from renewable resources (i.e. trees, grass). Reports indicate that only a very small net atmospheric buildup occurs in biomass combustion (for example, power generation) when the biomass is grown for sustainability. This is because released carbon dioxide is largely compensated for by that withdrawn from the atmosphere during photosynthesis.

Displacing a unit of energy from gasoline, with a unit of energy from ethanol in light-duty vehicles, results in a 90 percent reduction in carbon emissions. Similar reductions can be expected from other biofuels, such as methanol and biodiesel.

Another way to determine the dedicated energy crop potential for the United States is as follows: dedicated energy crop yields of about 2 ton of carbon/acre/yr currently are achievable from good cropland. It is estimated that biomass yield per acre could increase four-fold from 2.5 tons/acre currently to 10 tons/acre with some crops (e.g., switchgrass). If the approximately 56 million acres of idle cropland in the United States in 1995 were used to plant energy crops, this would yield 113 MMTC/yr fossil fuel carbon offset, or about 6.3 percent of total 1997 U.S. carbon emissions (from carbon dioxide).

Biofuel crops can be incorporated into land conservation systems such as windbreaks and shelterbelts within agroecosystems. Idle or abandoned agricultural land can be converted to biofuel production. In addition, there is potential to increase the use of crop residues for biofuels, provided this is consistent with the maintenance of adequate levels of soil organic matter and erosion control.

Conservation Tillage and Residue Management

Historical losses of carbon observed in many soils were due, in part, to low soil productivity, soil erosion, inadequate fertilization, removal of crop residues and other biomass, and intensive tillage. In general, high residue production, perennial forage crops, elimination of bare fallow, and reduced tillage will promote sequestration of soil organic carbon.

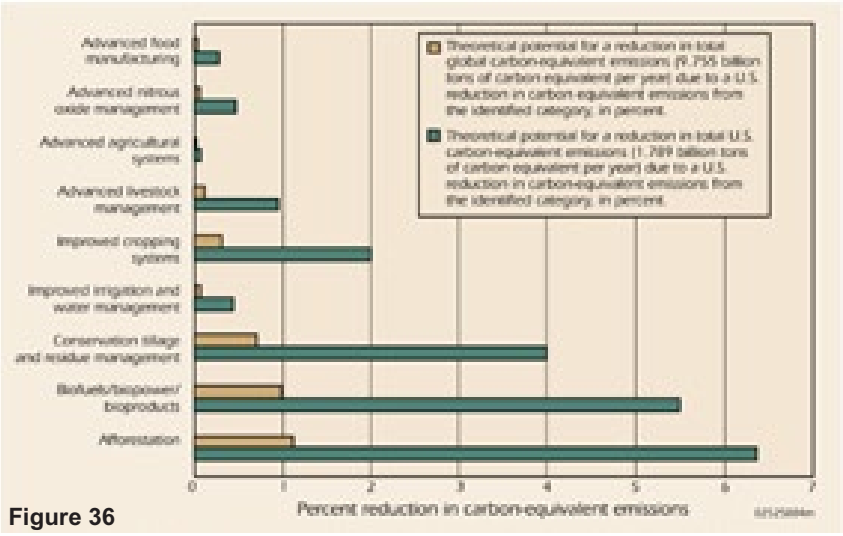


Figure 36

Maintaining and increasing soil organic matter (SOM) adds to soil fertility, water retention, and crop production. Conversion of large areas of cropland to conservation tillage, including no-till practices, during the next 30 years, could sequester all the carbon dioxide emitted from agricultural activities and up to 1 percent of today's fossil fuel emissions in the United States.

For the first time, U.S. farmers are planting more acres to crops and using more conservation tillage methods than traditional methods. In 1997, 37.3 percent of U.S. cropland was planted in no-till, ridge-till, and mulch-till systems compared to 36.5 percent conventionally tilled or plowed. The achievement represents a gain of 5 million acres.

Conservation tillage leaves at least 30 percent of the field covered with residue from previous crops after planting. For example, no-till planting has increased carbon content of soil from .2 to .4 tons per acre in one central Illinois farm over a 20-year period. Although no-till systems are setting the pace, reduced till is also on the rise. This method typically leaves 15 -30 percent residue on the land. Because U.S. cropland area is 13 percent of the world value, total carbon sequestration over 50 years in the United States would be 2,600 MMTC, or an average annual rate of 52 MMTC/yr.

Improved cropping systems represent current technologies that can be applied more effectively using existing techniques. Adoption of improved cropping systems has vast potential for increased carbon sequestration in agricultural lands already in use. An important component of best management practices (BMPs) is increasing the efficiency of fertilizer use.

Precision Agricultural Systems
For decades, agricultural managers have taken advantage of new technologies, including information technologies, that enabled better management decision making and improved economic efficiency of operations. The extent and rate of change now occurring in the development of information technologies have opened the way for significant change in crop production management and agricultural decision-making. Because agricultural information is so varied, the impact of new information-based technologies on greenhouse gas emissions is not yet certain.

Potential for Reduction

Methane

The most significant methane reduction opportunities for U.S. agriculture are in emissions from livestock. About one-third of the emissions reduction per unit of product are estimated to be from the dairy industry; whereas, two-thirds are from the beef industry.

Dairy Industry
Significant improvements in milk production per cow are anticipated in the dairy industry as the result of continued improvements in management and genetics. By increasing milk production per cow, methane emissions per unit of milk produced declines.

Beef Industry
Improvement in the quality of pastureland and grazing lands would yield reductions in methane emission through better digestion.

Animal Waste
Methane is produced during the anaerobic decomposition of the organic material in livestock and poultry manure. Liquid-based livestock manure systems, such as anaerobic lagoons, produce about 80 percent of the total methane. Methane recovery systems can collect the methane produced by liquid manure management systems so that the methane can be used as a fuel. With methane recovery systems, it is technically feasible to reduce total methane emissions from livestock manure by 80 percent. Although it is technically feasible for virtually all farms using liquid-based manure management systems, methane recovery systems are only profitable for some farms in warm climates. At these farms, it is profitable to collect the methane and use it to meet a portion of the farm's energy requirements.

Potential for Reduction

Nitrous Oxide

Soil Nitrogen
On a global scale, agricultural practices contribute approximately 70 percent of anthropogenic nitrous oxide emissions. These emissions occur primarily through decomposing organic matter in soil as it undergoes a series of oxidative and reductive processes, called nitrification and denitrification. However, it is the reductive process, denitrification, that is responsible for the primary loss of gaseous nitrogen compounds to the atmosphere. It is the loss of nitrogen as nitrous oxide that is of concern, because of the large global warming potential of nitrous oxide.

Human activities account for both direct and indirect nitrogen additions to soils. Direct additions occur through cropping practices, such as the application of synthetic nitrogen and organic fertilizers, production of nitrogen-fixing crops, cultivation of high organic soils, and through livestock waste management. Because interactions among the physical, chemical, and biological variables are complex; nitrous oxide fluxes from agricultural systems are highly variable in both time and space. Precision agriculture technologies could help reduce this variability.

Summary of Carbon Sequestration

Carbon sequestration in terrestrial ecosystems can be defined as the net removal of carbon dioxide from the atmosphere into long-lived pools of carbon. The USDA can take action to help reduce the emission of carbon and other greenhouse gases through a variety of measures. Forestation and conservation tillage systems are just two examples of what can be done by USDA to help offset the emissions of greenhouse gases.

Carbon Sequestration Facts

- Globally, agriculture contributes 20 percent of the greenhouse gases.
- Biomass yield per acre could increase four-fold from 2.5 tons/acre currently to 10 tons/acre with some agriculture crops; such as switchgrass, which would lead to carbon sequestration.
- Conversion of large areas of cropland to conservation tillage, during the next 30 years, could sequester all the carbon dioxide emitted from agricultural activities.
- In 1997, 37 percent of U.S. cropland was planted in no-till, ridge-till, and mulch-till systems compared to 36.5 percent conventionally tilled or plowed, which leads to additional carbon sequestration.
- The higher levels of carbon dioxide in the atmosphere are likely to enhance fertilization effects in plant growth and contribute to generally higher yields from global warming in the region.

Aging Watershed Dams

This section discusses the current status of aging watershed dams.

Since 1944, NRCS and local sponsors have been building floodwater-retarding dams primarily under the authority of Public Law-534 and Public Law-566. As a result of 240 small watershed projects being installed, more than 2,100 structures have been constructed in the Midwest Region. In the next 10 years, more than 200 floodwater-retarding structures in the region will reach the end of their 50-year evaluated life span. Many of these dams will need rehabilitation to ensure that they continue to contribute to clean water, environmental improvement, economic development, flood reduction, and in the development of an infrastructure on which many people and communities depend. (see figure 37)

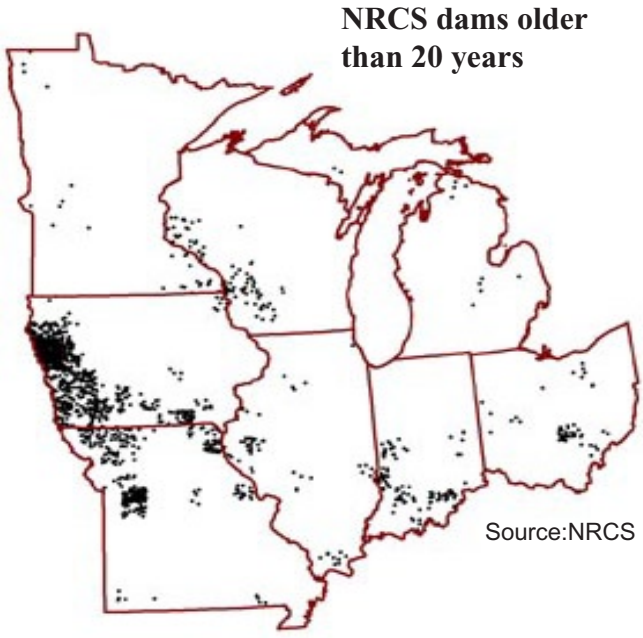


Figure 37

In 1998, it was estimated that these 2,100 floodwater-retarding dams generated more than $109 million in benefits. Without rehabilitation, many of these dams will no longer be able to protect communities and improve the health of watersheds by conserving natural resources. Failure of these dams could present an immediate threat to life, property, and health. The economic impact of a failure could be devastating to local communities. A recent survey indicated that NRCS would need an estimated $79 million to address rehabilitation needs on an estimated 700 floodwater-retarding dams within the region. Additional resources are needed to ensure that these floodwater-retarding structures continue to function and provide benefits.

Floodwater retarding dams have helped protect America's communities and natural resources for many years, but, like highways and houses, these dams need to be maintained and improved.